ISO TC 299 Standardization Activities in Robotics

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What topics do we need standards?

- **Mutual understanding**
  - Vocabulary
  - Coordinate systems, Signs

- **Safety**
  - We have to ensure that all people should be SAFE!!!

- **Performance**
  - Buyers want the best performing products
  - Manufacturers would like to exaggerate...
  - We need objective test procedures

- **Interoperability**
  - Connectors, communication...

- **Robot ethics**
International Organizations For Standardization on Robots

- **ISO**: International Organization for Standardization
  - Membership: 157 Nations
  - [www.iso.org](http://www.iso.org)

- **IEC**: International Electrotechnical Commission
  - Membership: 68 Nations
  - [www.iec.ch](http://www.iec.ch)

- **OMG**: Object Management Group
  - [robotics.omg.org](http://robotics.omg.org)

- **ASTM**: American Society for Testing and Materials
  - [http://www.astm.org/](http://www.astm.org/)

- **IEEE**: Institute of Electrical-Electronic Engineers
  - [www.ieee.org](http://www.ieee.org)
## ISO: Related Technical Committees

<table>
<thead>
<tr>
<th>TC</th>
<th>Title</th>
<th>Type of robot</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO TC 20</td>
<td>Aircraft and space vehicles</td>
<td>Aerial robot</td>
</tr>
<tr>
<td>ISO TC 22</td>
<td>Road vehicles</td>
<td></td>
</tr>
<tr>
<td>ISO TC 23</td>
<td>Tractors and machinery for agriculture and forestry</td>
<td>Agricultural robot</td>
</tr>
<tr>
<td>ISO TC 44</td>
<td>Welding and allied processes</td>
<td>Industrial robot</td>
</tr>
<tr>
<td>ISO TC 67</td>
<td>Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries</td>
<td>Underwater robot</td>
</tr>
<tr>
<td>ISO TC 85</td>
<td>Nuclear energy, nuclear technologies, and radiological protection</td>
<td>Nuclear robot</td>
</tr>
<tr>
<td>ISO TC 110</td>
<td>Industrial trucks</td>
<td>Automated Guided Vehicle</td>
</tr>
<tr>
<td>ISO TC 168</td>
<td>Prosthetics and orthotics</td>
<td>Medical robot</td>
</tr>
<tr>
<td>ISO TC 173</td>
<td>Assistive products for persons with disability</td>
<td>Medical robot</td>
</tr>
<tr>
<td>ISO TC 266</td>
<td>Biomimetics</td>
<td></td>
</tr>
<tr>
<td>ISO TC 299</td>
<td>Robotics</td>
<td>All robots</td>
</tr>
</tbody>
</table>
ISO TC 299 (Robotics)

- **History**
  - 1983: Created as TC 184/SC 2 (Robots for Manufacturing Environment)
  - 2003: Title changed to “Robots for Industrial Environment”
  - 2006: Title changed to “Robots and Robotic Devices”
  - 2016: Upgraded to TC 299 and title changed to “Robotics”

- **Brief Introduction**
  - Chair: ABB, Sweden
  - Secretary: SIS, Sweden
  - [https://committee.iso.org/home/tc299](https://committee.iso.org/home/tc299)
  - 27 P-member countries and 10 O-member countries
  - 18 International Standards
  - 12 standards under development
  - Fields: vocabulary, safety, performance, interoperability
  - Scope: Standardization in the field of robotics, except toys and military applications.
Organization of ISO TC 299

ISO TC 299 Robotics

- WG 1
  - Vocabulary & characteristics
- WG 2
  - Personal care robot safety
- WG 3
  - Industrial robot safety
- WG 4
  - Service robots
- JWG 5
  - Medical robot safety
- WG 6
  - Modularity for service robots

IEC TC 62
- Electrical equipment in medical practice
  - JWG 9
    - MEE and systems using robotic technology
  - JWG 35
    - Medical Robot for Surgery
  - JWG 36
    - Medical Robot for Rehabilitation
TC 299: International Standards

1. ISO 9283:1998 Manipulating industrial robots - Performance criteria and related test methods
4. ISO 9787:2013 Robots and robotic devices -- Coordinate systems and motion nomenclatures
5. ISO 9946:1999 Manipulating industrial robots - Presentation of characteristics
8. ISO 11593:1996 Manipulating industrial robots - Automatic end effector exchange systems -- Vocabulary/presentation of characteristics
9. ISO 14539:2000 Manipulating industrial robots - Object handling with grasp-type grippers -- Vocabulary and presentation of characteristics
12. ISO 8373:2012 Robots and robotic devices — Vocabulary
   Part 1: Locomotion for wheeled robot
15. ISO 19649:2017 Mobile robots – Vocabulary
16. ISO/TR 20218-1:2018 Robotics -- Safety design for industrial robot systems -- Part 1: End-
   effectors
   load/unload stations
18. IEC/TR 60601-4-1:2017 Medical electrical equipment -- Part 4-1: Guidance and interpretation --
   Medical electrical equipment and medical electrical systems employing a degree of autonomy
TC 299: Under development

5. ISO/CD 18646-4 Robotics -- Performance criteria and related test methods for service robots -- Part 4: Lumbar support robots
6. IEC/FDIS 80601-2-77 MEDICAL ELECTRICAL EQUIPMENT – Part 2-77: Particular requirements for the basic safety and essential performance of robotically assisted surgical equipment
7. IEC/FDIS 80601-2-78 MEDICAL ELECTRICAL EQUIPMENT – Part 2-78: Particular requirements for basic safety and essential performance of medical robots for rehabilitation, assessment, compensation or alleviation
WG 4: Service Robots

- **Structure**
  - Convenor: Cota Nabeshima, Octa Robotics, Japan
  - Task is not only to explore the need for standardization but also to develop standards for service robots.
  - It created WG 1, WG 2, JWG 5, and WG 6 during last decade.

- **Main Issues**
  - Service robot performance

- Any need for developing new standards on service robots could be discussed here.
ISO 18646 Robotics — Performance criteria and related test methods for service robots

- Part 1. Locomotion for wheeled robots – Published in 2016
- Part 2. Navigation – Published in 2019
- Part 3. Manipulation – CD preparation stage
- Part 4. Lumbar support robots– CD preparation stage

- Part x. Wearable robot
- Part x. Locomotion for legged robots (in indoor/outdoor environments)
- Part x. Climatic test
- Part x. Energy consumption and operating time, duty cycles, etc
- Part x. HRI(visual, audio, tactile)
Part 1. Locomotion for wheeled robots

- Rated speed
- Stopping characteristics
- Maximum slope angle
- Maximum speed on the slope
- Mobility over the sill
- Turning width
Part 2. Navigation

- Pose characteristics

- Obstacle detection
- Obstacle avoidance
Part 3. Manipulation

- Grasp characteristics
  - Maximum grasp size
  - Grasp strength
  - Maximum slippage resistance
Part 3. Manipulation

- **Use cases**
  - Turning a door knob
  - Opening a hinged door
  - Opening a sliding door
Part 4. Lumbar support robots

- Assistive Torque Index

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\begin{align*}
F_{\text{ref}} & : \text{Lifting force w/o lumbar support} \\
F & : \text{Lifting force w lumbar support}
\end{align*}
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<tr>
<th>TC</th>
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</tr>
</thead>
<tbody>
<tr>
<td>IEC TC 59</td>
<td>Performance of household and similar electrical appliances</td>
<td>Household robot</td>
</tr>
<tr>
<td>IEC TC 61</td>
<td>Safety of household and similar electrical appliances</td>
<td>Household robot</td>
</tr>
<tr>
<td>IEC TC 62</td>
<td>Electrical equipment in medical practice</td>
<td>Medical robot</td>
</tr>
<tr>
<td>IEC TC 108</td>
<td>Safety of electronic equipment within the field of audio/vid eo, information technology and communication technology</td>
<td>Entertainment robot</td>
</tr>
</tbody>
</table>
IEC TC 59

- TC 59/WG 16 (performance of household robots)
  - IEC 62849 Performance evaluation methods of mobile household robots
    - Convenor: Wilson Qu, China
      Sungsoo Rhim, Kyung Hee Univ, Korea
- TC 59 (performance of household and similar electrical appliances)
  - SC 59F(Floor treatment appliances)
    - WG 5 (Surface cleaning robots) - Started from May, 2009
    - Convenor: Sungsoo Rhim, Kyung Hee Univ, Korea
    - IEC 62929:2014 Cleaning robots for household use - Dry cleaning: Methods of measuring performance
      - Mobility - coverage rate in a standardized area
      - Dust removal - Dust collection
Thank you!